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Comparing Skin Staples to Sutures in an Emergency Department

SUMMARY

In a prospective randomized study, 52 lacerations requiring closure in the emergency department were either stapled or sutured. Six participating emergency physicians closed the wounds and recorded data about the laceration and the treatment provided. Patients visited their own family physicians for removal of the closures. Forty family physicians removed closures from 44 lacerations and reported follow-up data on discomfort levels, ease of closure removal, and cosmetic results. Lacerations were closed 2.7 times faster by the staple method ($p<0.001$), and there were no clinically significant differences between the two methods with respect to discomfort, infection rates, cosmetic result, or ease of removal. The staple device we used was more expensive than sutures. We concluded that the staple method of closure is safe, comfortable, and effective in the emergency department setting, and that the method's speed offsets its greater expense in some circumstances. (Can Fam Physician 1989; 35:505–509.)

RÉSUMÉ

Dans une étude prospective randomisée, 52 lacérations nécessitant réparation à la salle d'urgence ont été soit agrafées, soit suturées. Six médecins oeuvrant en salle d'urgence et participant à cette étude ont fermé les plaies et noté au dossier la description des lacérations et le traitement offert. Les patients ont vu leur médecin de famille pour l'exérèse des points de suture et des agrafes. Quarante médecins de famille ont enlevé les points ou agrafes de 44 lacérations et ont rapporté leur suivi quant aux niveaux d'inconfort, à l'exérèse des points ou agrafes et aux résultats esthétiques. Les lacérations ont fermé 2.7 fois plus rapidement par la méthode des agrafes (p 0.001) et il n'y eut aucune différence cliniquement significative entre les deux méthodes en ce qui a trait à l'inconfort, aux taux d'infection, résultats esthétiques ou facilités d'exérèse. Les agrafes se sont avérées plus coûteuses que les points. En conclusion, les agrafes constituent une méthode plus sûre, plus confortable et plus efficace dans le contexte d'une salle d'urgence et, dans certains cas, sa rapidité vient neutraliser le coût.

Key words: lacerations, staple closure, staples, wound closure

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SKIN STAPLES have recently become commonplace in the closure of surgical incisions,[1–10] although certain wounds have been judged unsuitable for staple closure.[11,12] As the cost of the stapler has decreased, physicians have begun using the device in emergency departments to close wounds.[13]

George and Simpson[13] compared suture to staple closure and found that the time to close a wound with staples was significantly less than with sutures, while the infection rates and cosmetic results were virtually identical.

A number of authors[14–16] have compared staples to sutures in experimentally contaminated wounds in animal models and have demonstrated superior results with staples.

Meiring and colleagues[10] compared sutures to staples in surgical incisions and found that cosmetic results were equivalent or better in stapled wounds.

The present study was undertaken to evaluate the safety, effectiveness, and comfort of skin staples, as compared to sutures, when used in an emergency department. Lacerations were closed by the emergency physician on duty, and the closures were later removed by the patient's usual family doctor. Staple closures were compared with sutures for ease of use, speed of insertion, patient comfort, and wound healing.

Methods

Patients presenting to the Chedoke-McMaster emergency units with lacerations requiring closure were asked to participate in the study. All lacerations were eligible for inclusion in the study except for lacerations to the face, hand, or pre-tibial areas.

We judged that the depth of the soft tissue in the hand and pre-tibial areas is insufficient to provide an adequate seat for the staples. We excluded face lacerations because we were unwilling to chance a poor cosmetic result in this prominent location. All 12 full-time emergency physicians were encouraged to participate in the study, but half of them found it too onerous to explain the study and obtain consent from patients. Even the participating physicians found there were times when the department was too busy to permit the extra time needed to enroll every eligible patient. No patient who was asked to participate in the study refused.

When a patient had consented, the emergency physician opened a sealed envelope containing the random assignment to staple or suture and forms for recording study data. Information recorded included patient identification, wound description (time since injury, cause of injury, length of laceration, ragged or clean edges, visible contamination, location of wound), and details of treatment (whether debrided, whether irrigated, number of closures used, time taken for anesthesia/debridement/irrigation, time taken for closure).

The emergency physicians treated all lacerations according to their usual practice and judgement. While a standard protocol would have provided a more precise comparison between the two closure methods, we wanted to evaluate staple closures under the conditions in which they would normally be used. With this objective, we decided not to have the patient return to the emergency department for closure removal and wound evaluation. Patients normally return to their own physicians for suture removal, and we wanted to determine whether staple closures would be as acceptable as sutures to family physicians in the community. We therefore decided to undertake the more cumbersome task of asking the patients' own physicians to participate in the study and report their findings.

The family doctors of participating patients were provided with a staple remover where required and were asked to complete a follow-up questionnaire at the time of the closure removal. Information recorded included the number of days the closures were in the skin, whether any closures fell out, the presence of tissue reaction, the presence of infection, the cosmetic result, and the ease of closure removal. The family physicians were asked to inquire about and record the level of discomfort that the patient experienced while the closure was in place and the level of pain the patient experienced during removal.

Participants in the study included 52 patients, six emergency physicians, and 40 family physicians.

Table 1
Wound Comparison

	Staple	Suture
Total	**22**	**26**
Time to Presentation		
<1 hour	9	10
1-2 hours	8	11
>2 hours	5	5
How Inflicted		
Metal	8	9
Glass	3	3
Crush injury	7	7
Wood	1	3
Other (ceramic, stone, dog bite)	2	4
Length of Wound		
≤2 cm	11	11
>2≤3 cm	8	4
>3≤4 cm	1	3
>4 cm	2	8
Range	1–18 cm	1–7.5 cm
Average	3.03 cm	3.30 cm
Edge of Wound		
Clean	19	16
Ragged	3	8
Crush	0	2
Contaminated		
No	21	25
Yes	1	1
Location		
Scalp	13	10
Arm	6	8
Leg	2	7
Neck	1	0
Trunk	0	1

Table 2
Treatment of Lacerations

	Staple	Suture
Debrided		
No	19	18
Yes	3	8
Irrigated		
No	17	12
Yes	5	14
Antibiotics		
No	21	25
Yes	1	1

Results

Of the 52 lacerations in the study,

25 were randomized to the staple group, and 27 to the suture group. One laceration assigned to the suture group was stapled, in error; three lacerations assigned to the staple group were sutured because the physician anticipated inadequate closure with staples. These four lacerations have been excluded from analysis.

The characteristics of the lacerations in the staple group were similar to those of the suture group in most respects (Table 1). Wounds in both groups were comparable in presentation time, in the way they were inflicted, in length, and in description. A disproportionate number of leg wounds were randomized to the suture group.

A greater proportion of lacerations were debrided and a greater proportion irrigated in the suture group. One patient from each group was prescribed antibiotics (Table 2). In the staple group, a total of 108 closures were used to close 66.7 cm of laceration—1.6 staples per cm. In the suture group, 142 closures were used to close 85.7 cm—1.66 sutures per cm.

A comparison of the time taken for preparation (anesthesia, debridement, and irrigation) and for actual closure is shown in Table 3. (In multilayer closures, time taken to insert deep sutures was not included.) However measured, stapling was more than 2.5 times as fast as suturing, a significant difference. Perhaps surprisingly, the preparation time was also over twice as fast for the staple group lacerations. Table 4 compares preparation times and close times of lacerations divided into various subgroups.

Four suture-group lacerations but no staple-group lacerations were lost to follow-up. The 44 wounds that were examined during follow-up showed similar results between the two groups (Table 5).

Discussion

Our study indicates that staples were as safe and effective as sutures in closing lacerations in our emergency units.

The significant difference between the two methods is in the time it takes to close a laceration. Preparation and closure was 2.5 times as fast in the staple group as in the suture group ($P<0.001$). Closure time alone was 2.8 times as fast ($P<0.001$).

We wondered whether the greater preparation time for the suture group lacerations resulted from some difference in the kind of lacerations in the two groups. Because of the uneven distribution of limb and scalp lacerations, we examined these two categories. We saw that 74% of limb lacerations had been debrided or irrigated, compared to 22% of scalp lacerations. This fact explained why more suture group wounds were debrided and irrigated. Yet even when we separated the lacerations into various subgroups and compared stapled limb lacerations to sutured limb lacerations, stapled scalp lacerations to sutured scalp lacerations, and so on, we found staple preparation to be faster. Not all of the differences shown in Table 4 are significant, due to the small numbers in some of the subgroups. Nevertheless, the table suggests that the faster times in the staple group are due to the staple method itself, not simply to the kinds of lacerations included in the staple group. A number of the reporting forms from the staple group bore the comment that no anesthesia had been required during closure; this may account, in part, for the reduced preparation time. There were two exceptionally slow closures in the suture group: a 3-cm dog bite that took a total of 30 minutes (1800 seconds) to prepare and close, and a 7.5-cm crush injury that took a total of 35 minutes (2100 seconds). If these two lacerations are excluded from the statistics, the preparation time ratio between the suture group and the staple group drops to 1.9 (from 2.3); the closure time ratio remains at 2.7.

Six emergency physicians participated in the study, closing lacera-

Table 3
Time Elapsed During Treatment

	Staple	Suture
Mean preparation time		
Seconds per laceration	97	281
Mean close time		
Seconds per laceration	109	391
Seconds per staple/suture	22	75
Seconds per cm[a]	46	128
a. Standard deviation	+/– 69.080	+/– 61.563
a. Range (sec/cm)	5–320	24–300

a. $p<0.001$

Table 4
Preparation Times and Close Times Compared by Subgroup

	Staple (sec/cm)	Suture (sec/cm)	Ratio
Preparation time			
All lacerations	44.2	99.3	2.25
Arm and leg	51.0	104.3	2.05
Scalp	31.1	101.0	3.25
Debridement and/or irrigation	69.6	125.6	1.81
Not debrided, not irrigated	29.7	57.1	1.92
Clean edge	37.5	98.7	2.63
Ragged or crushed edge	86.6	100.2	1.16
Closure time			
All lacerations	46.3	128.2	2.77
Arm and leg	31.7	126.2	3.98
Scalp	51.5	131.0	2.54
Debridement and/or irrigation	25.1	130.7	5.21
Not debrided, not irrigated	58.4	124.1	2.13
Clean edge	50.0	126.4	2.53
Ragged or crushed edge	23.0	131.0	5.70

tions. As each gained experience in using the stapler, staple closure times dropped. Thus, experience with the technique is likely to increase even more the speed of staple closures as compared to suture closures.

In a British study[13] where all laceration closures were carried out by one surgeon, stapling was four times as fast as suturing. In the British study, patients returned to the emergency department where a single surgeon removed the closures from all study wounds and a single observer evaluated wound healing; the closures were judged equivalent. In our study, we wanted to determine whether use of the stapler would meet with community acceptance, particularly because our patients do not generally return to the emergency department for follow up. We wanted to establish how easy or difficult it was for family physicians to use a staple remover with which they might have no experience and how they rated the cosmetic result. Forty family physicians participated in the study, removing closures. A family physician who experienced any difficulty in removing the staples or who observed a less than ideal cosmetic result was likely to comment negatively on stapling as a method of closure. By contrast, family physicians who experienced difficulty in removing sutures or saw imperfect cosmetic results either made no comment or attributed the problem to the nature of the wound. The results in Table 5 reveal no clinically significant difference in ease of removal or cosmetic acceptability between the two groups. We might predict some physician resistance to the staple closures until this method becomes more familiar to them.

A disadvantage of the disposable stapler is its cost. In our department we pay $1.47 for a package of 4-0 or 5-0 nylon suture with an FS 2 needle, or $4.04 with a P3 needle, whereas the Five-Shot® stapler costs $5.95. The less expensive suture package is used for most lacerations, at less than one quarter the cost of stapling. These figures do not take into account re-sterilization costs for equipment associated with suturing or equipment replacement costs.

Time saved by stapling may warrant the method's greater expense, especially when closing long lacerations. In the course of this study the author stapled the outer layer of an 18-cm laceration in eight minutes. It would have taken about 25 minutes longer to close this wound with sutures. The stapler is also valuable for closing lacerations in children. A short scalp laceration can be quickly stapled without anesthesia: one or two staples take less time to apply and seem to cause less discomfort than the injection of anesthetic. This speed of closure constitutes a big advantage over suturing when the patient is a frightened, squirming three-year-old child.

Conclusion

Stapling is a fast, comfortable method of closing many of the lacerations that present to an emergency department. In some situations, the speed of stapling may compensate for its expense. In our study, this method was highly acceptable to the participating emergency physicians, family physicians, and their patients.

The clinical and cosmetic outcome of the stapled wounds was virtually identical to that of sutured wounds. When this method of closure is selected, it is important to inform the patient that a special staple remover is required, so that he or she can either ensure that the family physician has such a remover, or return to the emergency department for removal.

Table 5
Results of Follow-up Examinations

	Staple	Suture
Total Followed	22	22
Lost to Follow-up	0	4
Average Time Closure in skin	8.18 days	8.36 days
Closures fell out		
No	21	21
Yes	1	1
Discomfort in situ		
1 (none)	16	13
2	5	5
3	0	3
4	1	1
5 (severe)	0	0
Tissue reaction (mild redness <5mm from edge, no pus)		
No	16	16
Yes	6	6
Infection		
No	21	21
Yes	1	1
Cosmetic results		
1 (poor)	0	0
2	1	3
3	7	5
4	4	5
5 (excellent)	10	9
Ease of removal		
1 (easy)	16	14
2	0	5
3	3	0
4	2	3
5 (difficult)	1	0
Pain on removal		
1 (painless)	9	16
2	8	4
3	2	1
4	2	1
5 (painful)	0	0

Acknowledgements

Thanks are due to 3M Canada for providing the Precise Ten-Shot® disposable skin staplers and staple removers used in this study.

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